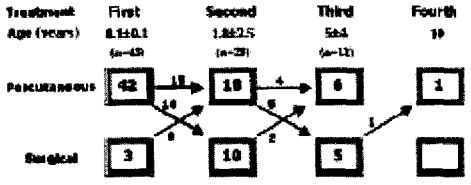
dure is summarized in the flow-chart. No further mortality was observed. Balloon angioplasty or stent implantation, applied as a second, third or fourth percutaneous procedure, were definitive in 16 (35%); combined surgery as second or third stage was a definitive procedure for coarctation in 12 (27%); 27 patients (60%) remain treated by percutaneous techniques at a mean follow-up time of 9±5 years. However, 17 of them remain with a single stage procedure in a shorter follow-up period (6±4 years). **Conclusion:** Combined percutaneous and surgical procedures are frequently needed for the management of severe CoA presenting at early age.



1168-160 Flow Characteristics Predict In-Stent Restenosis in Congenital Heart Disease

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Background: Intimal proliferation is a common complication of endovascular stent placement in many settings, though its importance in stents used for congenital heart disease has been controversial. We reviewed our experience to determine the frequency and potential predictors of significant in-stent restenosis (ISR).

Methods: All patients who had undergone endovascular stent placement were identified. Angiograms were evaluated at stent placement and the most recent catheterization prior to reintervention. Measurements were obtained from digital archive or 35mm film. ISR was defined as > 25% reduction in vessel diameter. Descriptive data were described as mean ± standard deviation or median with range as appropriate. Groups were compared using student's t-test for normally distributed and Mann-Whitney U for nonparametric data. Two-tailed significance was set at $p < 0.05$.

Results: Between 8/94, and 10/01, 123 stents were placed in 96 patients; 51 (41%) underwent follow-up catheterization. Thirty-six Palmaz® (PS) and 15 IntraStents® (IS) were placed in 41 pulmonary arteries, 4 aortas, 3 veins, and 3 conduits/baffles. Median age at deployment was 1.7 years (range 0.4-28.6). At 14.2 ± 11.4 months follow-up, neointimal proliferation ranging from 0.5 to 3.6mm was present in 27/51 stents (53%). Proliferation was focal in 8, diffuse in 19, and caused significant ISR in 15/51 (29%). ISR was not associated with the technical aspects of deployment (overdilation, incomplete stent expansion, distal vessel stenoses), or stent type. However, flow characteristics and stent size predicted restenosis. ISR occurred in 8% of vessels with non-pulsatile flow (veins and pulmonary arteries in a cavopulmonary circulation), compared with 37% in which flow was pulsatile ($p < 0.04$). ISR did not develop in any vessel > 9mm in diameter. Complications included thrombosis within one PS (innominate vein), fracture in one IS (coarctation), and restenosis of a previously dilated jailed side branch.

Conclusion: ISR is important in stents used for congenital heart disease, particularly at smaller diameters. Blood flow dynamics play an essential role in the development of neointimal proliferation.

1168-161 Pulse Pressure Propagation Changes in the Aorta With a Stent: An In Vitro Study Simulating an Adequate Result of Coarctation Treatment With a Stent in Place

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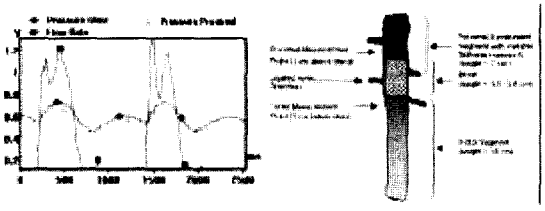
Background: Interposition of a noncompliant stent within the aorta may result in a pressure gradient across the stent at rest and during exercise. This in vitro study was aimed to characterize the pressure changes within the stent and measure pulse wave propagation though it. **Methods:** A pulsatile pump, generating 6 stroke volumes (15 - 40 ml/beat) with heart rate 50 and 85 bpm, was connected to 3 fresh descending thoracic pig aortas (22 cm long). The proximal (prox) segment was denatured by heating to model abnormal prox aortic stiffness (prox: $\beta = 4.5$; distal: $\beta = 2.74$); 4 cm long endovascular stents (Palmaz 4014) were then expanded to the diameter of the aorta (ø 14-18 mm) yielding a stented segment with stiffness index of $\beta = 5.9$. **Results:** Pressure gradient across the "repaired" coarctation before stenting ranged from 3-17 mmHg peak to peak and 5-18 mmHg with "exercise". After stent placement, gradients were 2-22 mmHg at rest and 4-28 mmHg with "exercise". Peak systolic pressures within the stent were higher than the prox pressures, mean: 12.89 ± 2.84%, $p = 0.04$ at rest and with "exercise" 17 ± 3.14%, $p < 0.0001$. Pulse wave propagation correlated well with flow resistance and the pressure increase ($r = 0.78$) in the stented segment. **Conclusions:** Our study showed that placement of a noncompliant stent with the increased stiffness of the segment and the resulting increased rate of pulse wave propagation produces a pressure increase within the stent and increases the total maximal gradient across the aorta.



1168-162 Follow-Up Results of Cutting Balloon Angioplasty for Pulmonary Artery Stenosis in Children

Lisa Bergersen Audrey C. Marshall, Peter Lang, Stanton B. Perry, James E. Lock, Children's Hospital Boston, Boston, MA

Background: Cutting Balloon angioplasty (CBA) appears to acutely enlarge branch pulmonary arteries (PA) previously resistant to transcatheter therapy, although vascular "trauma" and the need for rescue stenting seems to be more prevalent. We therefore analyzed follow-up catheterization (f/u cath) data following CBA to look for early restenosis or progressive aneurysms.

Methods: A data base search (IRB approved) identified all patients who underwent CBA for PA stenosis from 6/01 to 8/02. The analysis was limited to individuals with f/u cath data and adequate PA angiography.

Results: Ten patients ages 0.4-10 years, median 2 years, who received CBA for one or more PAs resistant to conventional high pressure (> 8 ATM) balloon therapy were also catheterized 6 +/- 2 months after the initial CBA. At the initial CBA procedure in these 10 patients, 30 vessels with an initial minimum lumen diameter of 1.5 +/- 0.9 mm were enlarged to 3.1 +/- 1.2 mm ($p > 0.001$); 93% of the procedures were successful at enlarging the vessel > 50%. Fourteen of the 30 vessels had angiographic evidence of vascular damage and 7 of these 14 vessels required additional stent placement.

At f/u cath, 8 of 30 PAs had evidence of restenosis as defined by a > 50% loss in the initial enlargement of the PA diameter. Four of these PAs required a stent at the initial procedure; 1 of 4 stents was occluded. Of the 4 remaining PAs, 3 had angiographic evidence of vascular damage following CBA; 1 PA, which did not meet criteria for successful angioplasty at the initial procedure, lost the minimal gains achieved. All the restenotic PAs, except for the occluded stent, underwent further angioplasty to enlarge the PA lumen from 2.3 +/- 1.0 mm to 3.7 +/- 0.4 mm (vessel diameter after CBA 3.5 +/- 0.9 mm). The remaining 22 PAs maintained a lumen diameter of 2.8 +/- 1.3 mm compared to 2.9 +/- 1.3 mm after CBA. No progressive aneurysms occurred in the follow up interval.

Conclusions: Restenosis occurred in half of the PAs with a stent or angiographic evidence of vascular damage following CBA. The remaining 74% of CBA treated PAs maintained initial gains in diameter without developing aneurysms at f/u cath. These data suggest that "conservative" CBA techniques may result in less PA restenosis.

POSTER SESSION

1192 Adult Congenital Heart Disease II

Tuesday, April 01, 2003, Noon-2:00 p.m.
McCormick Place, Hall A
Presentation Hour: 1:00 p.m.-2:00 p.m.

1192-155 Emergency Hospital Admissions and Three-Year Survival of Adults With Congenital Cardiac Disease

Sohrab Fratz Harald Kaemmerer, Ulrike Bauer, Erwin Oechslin, Alfred Hager, Silke Brodherr-Heberlein, Bernhard Zrenner, John Hess, Deutsches Herzzentrum München, TU München, Munich, Germany, Deutsches Herzzentrum Berlin, Berlin, Germany

Background: The number of emergency hospital admissions of adults with congenital cardiac disease (ACCD) is increasing. Aim of this study was to determine quantity and nature of emergencies leading to an unscheduled hospital admission and mid-term survival of these patients. Methods: During one year 429 ACCD were admitted 571 times into three tertiary care centers. 124 (22 %) admissions of 95 (22 %) patients were acute. 15 of the 95 patients were seen for the first time. The underlying congenital cardiac anomalies were: Fallot's tetralogy / pulmonary atresia with ventricular septal defect (n=26 / 7), univentricular heart after Fontan procedure (n=25), atrial septal defect (n=18), Eisenmenger syndrome (n=12), complete transposition after atrial switch (n=11), and others (n=25). Results: Main indications for acute hospital admission were cardio-vascular (n=103; 83%) (arrhythmia, cardiac failure, syncope, pacemaker problems, pericardial tamponade, sudden death), infection (n=8, 6%) (endocarditis, pacemaker infection, pneumonia, cerebral abscess), acute chest pain (n=7; 6%), or acute abdomen (n=4; 3 %). 16 patients (17 %) needed urgent cardiovascular or abdominal surgery. Six patients (5 % of the admissions) deceased. The survivors were hospitalized for 9±11 days. During a follow-up of 2.9 ± 0.8 years 16 (18 %) of the discharged patients died. Two additional patients had a heart / heart-lung transplantation. Conclusions: ACCD can